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ABSTRACT

The purpose of the study is to investigate the changes in computer anxiety, attitudes towards computers, and feelings related to computers among students due to participation in the basic course of computer science. The theoretical background is based on theories of human-computer interaction, test anxiety, and resistance to change. The subjects were 29 education majors in the basic computer science course. They answered a three-part questionnaire both at the beginning and at the end of the course. The main result of the study indicated that the basic course in computer science reduced anxiety. The experience with computer equipment and the use of computers reduced anxiety most of all. The course also had positive effects on the following attitudes toward new technology: the impression of human-computer interaction and the impression of computers in the future. At the end of the course the students' estimation of their own knowledge was much higher that at the beginning of the course. The course also had a strong effect on negative feelings in that it reduced the fear of failure and the desire to escape. (Contains 9 references.) (Author/ALF)

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THE CHANGES IN COMPUTER ANXIETY IN A REQUIRED COMPUTER COURSE

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Abstract

The purpose of the study is to investigate the changes in computer anxiety, in the attitudes towards computers, and in the feelings related to computers among students due to the participation in the basic course of computer science. The theoretical background is based on theories of human-computer -interaction, of test anxiety and of the resistance of change. The subjects of the study were 29 teacher students in the basic course of computer science. They answered a questionnaire, consisting of three parts, both at the beginning and at the end of the course. The main result of the study indicated that the basic course in computer science reduced anxiety. The experience of computer equipment and the use of computers reduced anxiety most of all. The course had also positive effects on the following attitudes towards new technology: the impression of human-computer -interaction and the impression of computers in the future. In the end of the course the students' estimation of their own knowledge was much higher than at the beginning of the course. The course had also strong effect on negative feelings: it reduced the fear of failure and the desire to escape.

Introduction

The continuing development of technology nowadays has strong effects on schools and every kind of educational act. People think mainly that computers are good teaching tools, but there are also many negative aspects related to the use of computers. These negative interpretations, like *anxiety*, usually occur in situations where one is learning something new and this causes the *resistance of change*. The anxiety also causes negative effects on cognitive performances. *Computer phobia* is defined as a) the resistance to talk about computers or even think about them, b) the fear or the anxiety towards computers and c) angry or aggressive thoughts towards computers (Jay 1981). In this study I, however, talk about *computer anxiety* instead of computer phobia, because a computer differs from other objects of fear. In computer anxiety the fear has a computer as an object. The fear is not only the fear towards a machine, but it has many unclear and *mystic* elements before proper knowledge and experience. It is also typical of computer anxiety that it is dangerous for an anxious person though it is not dangerous in general. It is important to reduce anxiety, because it has negative effects on learning.

Theoretical framework

Computer technology is getting more and more general nowadays. The development of new technology puts the children of the industrialized countries in a whole new situation when they get used to computers already in *childhood*. This experience of computers is, of course, accidental and depends on a child himself. The situation is, however, more problematic among *adults*, because many of them have not got familiar with computers until adult. Thus, it is important to notice people's opinions about computers. Do they think computers are controllable or not? (See Weizenbaum 1984)

Human-computer -interaction is a complex wholeness that causes different kinds of emotional interpretations. These interpretations depend on many factors like the user's experience and activity, social support, the sense of control, coping-strategies, personal characteristics and the common effects of all these.

Why is it then so difficult to get used to computers? *People have to adapt to a computer's ways of functioning instead of one's own thinking* and because people do not think like computers, it causes trouble. Computer technology was earlier used as a weapon of experts. Experts emphasized the limitations to people set by computers and so they raised their own position as experts. This easily made people easily reserved and even anxious. Nowadays markets are, however, competing with user friendly systems.

People who resist the use of computers in the learning process argue it with two reasons. First, according to their opinion, *the computer-assisted instruction lowers human dignity*. But if students themselves are believed, the situation is contrary. Most of students think that using computers is exciting and that computers are "friendly". Second, according to another reason *the computer-assisted instruction is accepted only by the students who have experiences with computers*. We can, however, critisize this myth too. The more experienced students are more critical of for example in technical problems even though their attitudes still remain positive. (Clements 1981)

In human-computer -interaction one of the negative interpretations is computer anxiety, which interferes with the communical nature of the interaction. Computer anxiety can be seen as a specific form of test anxiety. Both forms of anxiety are usually related to performance situations and a person is calm outside the stressful situation. *Test anxiety* is defined as an unpleasant feeling or emotional state, which has psychological effects on behaviour and which occurs usually in testing and estimating situations. (See Dusek 1980) A person processes too much irrelevant information that interferes with concentration. One gets anxious especially in difficult performances, not so much in routine tasks.

Computer anxiety is defined as a fear or a prejudice, which appears when one is using computer technology or when he is thinking the consequences of the use. A person gets anxious about the use, even though the computer itself is not dangerous at all. (See Maurer 1983; Marcoulides 1989) Computer anxiety can be classified as state anxiety, when it is related to some situation. But does it have connections to trait anxiety too, when anxiety is a trait of character? Some characteristics of trait anxiety also point at state anxiety. Fear of failure is for example typical for trait anxious people and that makes them avoid difficult performances. The learning and the use of computers is often experienced as a difficult performance. It is also important to reduce computer anxiety, because it is harmful for learning and effective use of computers. To reduce computer anxiety, the reasons for the anxiety (like equipment, software or environment) have to be clarified first. In that way the right kind of education can be planned. Many studies have indicated that experience reduces computer anxiety. Because computer anxiety is not a stable feature but a form of state anxiety, it is our hypotheses that computer anxiety can easily be changed by increasing experience.

Method

The aims of the study was to clarify if the experience got from a computer course reduced computer anxiety. What kind of effects did the course have on attitudes towards computers? What about thoughts and feelings? Were they more positive at the end of the course?

The subjects of the study were 29 first-year students of education in the University of Joensuu. They participated in the basic course in computer science in spring 1989. The course consisted of lectures and practices. In the lectures, for example, subjects like computer-assisted -instruction, the position of computer technology in the future and artificial intelligence were presented. At the end of the course the students had an exam. In the practices the students first got familiar with the structure of computer equipment and an operating system. After that they used computers as a tool; they used word processing, spreadsheet and card index software. During the practices the students did some practical work with the software they were studying.

The students answered a questionnaire which was originally planned by Californian researchers Rosen, Sears and Weil. The questionnaire consisted of three parts. The first part handled *anxiety* related to computers, the second *attitudes* towards computers and the third *thoughts and feelings* related to computers. The factors of the first part were in this study the following: the use of computers, computer equipment, learning new things related to computer technology and position of computers in the future. The second part had the following factors: human-computer -interaction, position of computers in the future, computers and jobs and evaluation of the own knowledge. In the third part the factors were the following: hope of success, fear of failure and desire to escape. A pretest-posttest -arrangement was used in the study; the students answered the questionnaire both at the beginning and at the end of the course. The data was analysed by using factor analysis and one-way variance analysis.

Results and discussion

The main result of this study indicated that the basic course in computer science reduced computer anxiety. At the end of this course the students' own estimation of their own knowledge was much higher than at the beginning of the course. Thus, the computer anxiety is reduced because of increased knowledge and *experience*. The result is supported by other studies, which all indicated that the experience about computers reduces computer anxiety (See Asikainen 1990, Cambre & Look 1985, Kolehmainen 1991).

In this study the basic course in computer science especially reduced anxiety of two indicators: computer equipment and the use of computers. Most of the students had no experience about computer equipment and about the use of computers at the beginning of the course. That is why anxiety was much higher at the beginning than at the end of the course when the students were already more experienced.

The course also had positive effects to attitudes towards computers. The attitudes towards human-computer -interaction (intelligence of people and computers), towards the position of computers in the future and towards computers and jobs were more positive in the end of the course. The students' own evaluation of their knowledge was also higher in the end of the course. In the area of this indicator more positive attitudes were consequences of the increased knowledge. Negative feelings related to computers such as the fear of failure and the desire to escape were reduced during the course. So, the course had a positive effect also to the thoughts and feelings related to computers.

This kind of pre-experimental arrangement has many methodological problems. First, is it really the course that reduces anxiety or could it be, for example, a time effect or maturation between the pretest and posttest? The students may have learned something about computers from elsewhere also or they may have learned something from the pretest itself. Computer anxiety and the attitudes towards computers can be studied also in many different ways than in this study has been presented. One possible way is to increase some qualitative aspects to study when a person could tell in a deeper way how he feels. How can the anxiety then be reduced? The people's experience should be increased in any way and all the borders in front of this experience should be eliminated. This is important, because anxiety reduces effective use of computers and has negative effects on learning.

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